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(54) Title: THIN FLAME RESISTANT SOLID SURFACE MATERIAL

(57) Abstract: Thin flame resistant solid surface material is provided from compositions containing an acrylic polymer matrix having dispersed therein controlled amounts of magnesium hydroxide as filler, antimony oxide and a brominated flame retardant.

THIN FLAME RESISTANT SOLID SURFACE MATERIAL

Background Of The Invention

1. Field of the Invention

This invention relates to a flame resistant thermoplastic acrylic composition comprising an acrylic polymer matrix, filler and a combination of flame retardant materials. The material is in thin solid surface form which when subjected to a flame is self-extinguishing and generates a minimum amount of smoke.

2. Description of the prior art

In developing flame retardant polymeric compositions it is known, as disclosed in US 4,243,579, to use combinations of halogen-containing compounds and antimony oxide to impart flame retardant properties. However, there are several disadvantages in the use of such combinations, which include dense smoke production on burning, and the existence of afterglow on burning. ASTM E-84 specifies a standard test method for surface burning characteristics of building materials. The test results cover two parameters; flame spread and smoke developed during a 10-minute fire exposure. Inorganic cement board and red oak flooring are used as comparative standards and their responses are assigned arbitrary values of 0 and 100 respectively. The classifications are as follows for interior wall and ceilings.

ASTME E-84 TEST CLASSIFICATIONS

Class	Flame Spread	Smoke Developed
I	0-25	0-450
II	26-75	0-450
III	76-200	0-450

While thick sheets of known solid surface materials may meet Class I standards, sheets having a thickness of less than about 0.25 inch (.635 cm) have not met the Class I standard. Accordingly, there is a need to provide new compositions, which meet the ASTM E-84 Class I test.

Summary Of The Invention

It has been found that Class I ASTM E-84 test standards are met by providing thin solid surface materials from thermoplastic compositions containing an acrylic polymer matrix having dispersed therein controlled amounts of

magnesium hydroxide as the filler, and antimony oxide and a brominated flame retardant.

Description Of The Preferred Embodiments

Preferred embodiments of the acrylic resin based compositions contain from about 45% to 65% by weight based on the total weight of the composition of magnesium hydroxide, from 0.15% to 15% by weight of antimony oxide, and 5% to 20% by weight of a halogenated flame retardant.

The antimony hydroxide may be selected from any of tri-, tetra-, penta-antimony oxide or combinations thereof. The halogenated flame retardant is selected from brominated compounds such as tetradecabromophenoxybenzene, pentabromodiphenyl ether, octabromodiphenyl ether, decabromodiphenyl ether, tetrabromobisphenol A and its derivatives, tribromoneopentyl alcohol, hexabromocyclododecane, tribromophenyl allyl ether, tetrabromodipentaerythritol, bis (tribromophenoxy)ethane, ethylene bis(dibromonorbornane) dicarboximide, tetrabromobispenol S, bis(2,3-dibromopropyl)ether, and poly(pentabromobenzyl) acrylate. These flame retardants are commercially available.

The acrylic resins useful in the present invention are commercially available thermoplastic resins that can be formed into high performance decorative solid surface material. .A particularly good and especially preferred resin which meets all of the above properties is poly(methyl methacrylate).

As used herein, the term "thermoplastic" refers to polymers that are reversibly deformable (able to be softened) after being heated above their softening or glass transition temperatures and then cooled. These materials are capable of being repeatedly melt processed in plastic manufacturing machinery. As is generally accepted by those skilled in the art, thermplastic polymers include polymethacrylates and methyl methacrylates such as C_2-C_{22} alkyl(meth) acrylate monomers. More particularly, the thermoplastic matrix material may be an impact modified polymethacrylate. Suitable impact modifiers include, for example, elastomeric polymers such as graft polymers of methyl methacrylate and styrene or butadiene, copolymers of butyl acrylate and methyl acrylaste or other well known impact modifiers present in amounts from 0 to 25 weight percent.

The presence of significant amounts of fillers other than magnesium hydroxide detract from the adventitious flame retardant attributes of the products of this invention. Accordingly, the products of this invention should be substantially free of such fillers.

It is permissable to include in the products of this invention controlled amounts of additives such as pigments, dyes, parting agents, fluidizing agents, viscosity control agents, curing agents, antioxidants, and the like as are known to those of ordinary skill in the art in amounts that do not detract from the flame retardant attributes of the products of this invention.

The solid surface material maintains its pleasing aesthetics, is easy to maintain and provides excellent flame retardance in a variety of end uses such as bathroom wet walls, wall partitions or wall cladding.

The following examples in which parts and percentages are by weight unless otherwise specified further illustrate products of the present invention. All samples have a thickness of 0.125 in.(0.3175 cm.)

Examples

Example 1

A sample of the following composition was compounded on a *W&P* twin-screw extruder

50% magnesium hydroxide filler,

12% tetradecebromophenoxybenzene flame retardant obtained from the Albemarle Co., sold under the tradename "Saytex"

3% antimony oxide,

35% PMMA acrylic pellets obtained from AtoChem

The material was then re-extruded on a single screw extruder through a sheet die to make a 24 inch wide sheet (60.96 cm) for testing in accordance with the ASTM E-84 test.

In testing it was found that the sheet had the following properties meeting Class 1 standards of ASTM E-84:

Flame spread 20

Smoke generation 100

The flame was self –extinguishing and smoke generation was low.

The sheet was useful as a solid surface material for walls and ceilings.

Example 2

The following composition was compounded on A Buss kneader:

55% magnesium hydroxide
2% antimony oxide
8% tetradecabromophenoxybenzene
35% PMMA acrylic pellets obtained from AtoChem

The material was reextruded on a single screw machine with a 2 inch sheet (5.08 cm) die and tested in an ASTM E-84 flame tunnel. It met the Class 1 standards of ASTM E-84. The flame was self-extinguishing and smoke generation was low.

Flame spread 25
Smoke generated 105

Example 3 (Comparative Example)

Material having the following composition was compounded on a twin-screw extruder as above:

60% magnesium hydroxide
40% PMMA

Again the material was made into sheets with the the following results:

Flame 85
Smoke 5

The sheets had an ASTM E-84 Class II rating. They did not meet Class 1 standards thus showing the need for the halogenated flame retardants to slow flame spread .

Example 4 (Comparative Example)

Example 2 was repeated with the following composition being extruded on a Buss kneader:

35% magnesium hydroxide
3% antimony oxide
12% tetradecabromophenoxybenzene
50% PMMA

Sheets prepared from the material had a Class III ASTM E-84 rating.

Flame spread 80
Smoke 290

The material did not contain the minimum level of magnesium hydroxide needed to keep flame spread low.

Example 5 (Comparative Example)

Example I was repeated with the following composition being extruded on a twin-screw extruder:

13% calcium carbonate.
20% tetradecabromophenoxybenzene
5% antimony oxide
62% PMMA

After forming the above composition into sheets, an ASTM E84 rating of Class II resulted . The flame spread index was 75, and the smoke index was 475. No magnesium hydroxide was present in the composition.

TITLE
THIN SOLID SURFACE FLAME RESISTANT MATERIAL

CLAIMS

WHAT IS CLAIMED IS:

1. A flame retardant composition comprising an acrylic resin matrix having dispersed therein magnesium hydroxide as filler, antimony oxide and a brominated flame retardant.

2. The composition of claim 1 in the form of a self-extinguishing solid surface material having a thickness of less than 0.25 inch (.635 cm), said material meeting the ASTM E-84, Class I flame and smoke rating requirements.

3. The composition of claim 1 wherein the filler is present in an amount from 45% to 65% by weight based on the total weight of the flame retardant composition.

4. The composition of claim 3 wherein the composition contains from 0.15% to 15% by weight of antimony oxide and 5% to 20% by weight of a halogenated flame retardant.

5. The composition of claim 4 wherein the acrylic resin is polymethylmethacrylate.

6. The composition of claim 5 wherein the brominated flame retardant is tetradecabromophenoxybenzene.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/02322

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C08K3/20 C08K3/22 C08K5/02 C08K13/02 C08L33/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C08K C08L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 407 992 A (KEOGH MICHAEL J) 4 October 1983 (1983-10-04)	1-4
Y	claim 1; examples 13,15; tables 3,5 column 3, line 3-30 column 4, line 6-13 column 5, line 12-14	5,6

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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